

A REVIEW OF THE AMERICAN GENERA AND SPECIES OF BATRACHIDÆ.

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In the present paper we have attempted to collect the synonymy of all the genera and species of Batrachidæ known from American waters.

The specimens examined by us all belong to the Museum of the Indiana University.

Analysis of Genera of Batrachidæ.

- a. Dorsal spines two; opercle very small, its posterior part developed as a single strong spine; subopercle feebly developed, narrowed and not ending in a spine; body scaleless.
- b. Spines of dorsal fin and operculum hollow and connected with venom glands; lateral line on sides of body single; no canine teeth. THALASSOPHRYNE. 1.
- bb. Spines solid, without venom glands; several lateral lines on sides of head and body, composed of pores and shining spots, some of these accompanied by cirri; canine teeth present; vertebræ 12 + 31; frontal region depressed, forming a triangular area below level of temporal region, its median ridge very low. PORICHTHYS. 2.
- aa. Dorsal spines three; opercle developed as two strong diverging spines; subopercle rather strong, with two spines similar to those of opercle.
- c. Body scaleless; branches of subopercular spine parallel, the lower branch much the shorter; vertebræ 10 + 22; frontal region not depressed, its median ridge prominent. BATRACHUS. 3.
- cc. Body scaly; branches of subopercular spine subequal and diverging; frontal region broad, flat and slightly depressed, its median ridge rather prominent.

BATRACHOIDES. 4.

1. THALASSOPHRYNE.

Thalassophryne Günther, Cat. Fish. Brit. Mus., iii, 1861, 174 (*maculosa*).

In this genus only five species are recognized. These have been well described by Dr. Günther and Dr. Steindachner. They are noted for the development of poison glands in connection with their spinous armature.

Analysis of Species of Thalassophryne.

Common Characters.—Dorsal spines two; opercle very small, its posterior part developed as a single strong spine; subopercle feebly developed, narrowed and not ending in a spine; no scales on body. Spines hollow and connected with venom glands. Lateral line on sides of body single; no canine teeth. America.

a. Dorsal and anal fins joined to the caudal; teeth on premaxillaries smaller than on lower jaw; eye very small; lower jaw the longer. D. II-20; A. 18 or 19.

b. Anterior teeth on jaws in two rows.

c. Pectoral fins short, their tips reaching just to front of anal; head as wide as long; opercular spine about $\frac{1}{4}$ length of head; caudal $\frac{1}{2}$ length of head. Color chocolate-brown; no distinct dark bands on head; body, except belly and under side of head covered with numerous small, dark, round spots; anal clear brownish gray, edged with dark brown; no dark bands on sides of body. (*Steindachner.*)

Punctata. 1.

cc. Pectoral fins longer, reaching past third or fourth anal ray; head $1\frac{1}{3}$ times as long as wide; opercular spine about $\frac{1}{3}$ length of head; caudal $\frac{2}{3}$ of length of head; mouth very oblique. Color brownish, marbled with darker; two distinct bands on head; dorsal and anal with brown spots arranged in distinct rows; six dark bands on sides of body, the first at spinous dorsal, the others along the base of soft dorsal. (*Steindachner.*)

Amazonica. 2.

bb. Anterior teeth on lower jaw forming a band; mouth moderately oblique; head less than 3 in length of body; interorbital width $5\frac{1}{3}$ to $5\frac{1}{2}$ in length of head. Color more or less clear reddish brown; belly brownish yellow; base of fins reddish brown or whitish, the upper part of the fins deep dark brown, the two colors separated by a distinctly marked whitish streak. (*Steindachner.*) *Nattereri.* 3.

aa. Dorsal and anal fins not joined to the caudal.

d. Dorsal and anal fins rather short (D. II-19; A, 18); pectoral fins short, their tips reaching to origin of anal. Color brown, marbled with darker; pectoral fins and sides of body with some round black spots; chin and ventrals brownish; belly white. (*Günther.*)

Maculosa. 4.

dd. Dorsal and anal fins longer (D. II-24; A, 24); pectoral fins longer, their tips reaching to sixth anal ray. Color of head, body, and fins brown, with a network of yellowish lines; dorsal, anal, caudal and pectoral fins with white margins. (Günther.)

Reticulata. 5.

1. *Thalassophryne punctata.*

Thalassophryne punctata Steindachner, Ichthyol. Beiträge, v, 1876, 121 (Bahia; Porto Seguro.)

Habitat.—Coast of Brazil.

This species is known to us only from Steindachner's description.

2. *Thalassophryne amazonica.*

Thalassophryne amazonica Steindachner, Ichthyol. Beiträge, v, 1876, 113 (Amazon River).

Habitat.—South America, Amazon Basin, in fresh water.

This species is known to us only from the description of Steindachner.

3. *Thalassophryne nattereri.*

Thalassophryne nattereri Steindachner, Ichthyol. Beiträge, v, 1876, 115 (Para).

Habitat.—Amazon Basin; Para.

This species is known to us only from the description of Steindachner.

4. *Thalassophryne maculosa.*

? ? *Batrachus gronovii* Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 482 (America).

? ? *Callionymus niqui* Gronow, Cat. Fish., Ed. Gray, 1854, 45.

Thalassophryne maculosa Günther, Cat. Fish. Brit. Mus., 1861, 175 (Puerto Cabello); Günther, Fishes of Central America, 1869, 436, pl. 68, fig. 1 (Puerto Cabello).

Habitat.—Eastern Coast of Central America; Puerto Cabello.

This species is known to us only from the description of Dr. Gunther.

Batrachus gronovii of Cuvier & Valenciennes = *Callionymus niqui* Gronow, perhaps, belongs to some species of this genus; but of this there can be no certainty, the descriptions are too imperfect.

5. *Thalassophryne reticulata*.

Thalassophryne reticulata Günther, Proc. Zoöl. Soc. London, 1864, 150
155 (Panama); Günther, Fish. Central America, 1869, 437, pl. 68,
fig. 2 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626
(Panama).

Habitat.—Western Coast of Central America; Panama.

This species is known to us only from the accounts of Dr. Günther and Professors Jordan and Gilbert.

2. PORICHTHYS.

Porichthys Girard, Proc. Acad. Nat. Sci. Phila., 1854, 141 (*notatus* =
margaritatus).

This genus is remarkable for the development of its mucous pores, or "lateral lines." The number of vertebræ in *Porichthys* is much greater than in *Batrachus*, and the skull is somewhat different.

Analysis of Species of Porichthys.

Common Characters.—Dorsal spines two; opercle very small, its posterior part developed as a strong, single spine; suboperculum feebly developed, narrowed and not ending in a spine; no scales on body; spines solid, without venom glands; several lateral lines on sides of head and body, composed of pores and shining spots, some of these accompanied by cirri; canine teeth present; vertebræ 12 + 31; frontal region depressed, forming a triangular area below level of temporal region, its median ridge very low. Branchiostegals 6; interorbital area short, wide, and with shallow grooves. Air bladder more or less deeply divided into lateral parts. Pyloric appendages none.

a. Abdomen with two longitudinal series of pores, none of them accompanied by shining bodies; vomer with one canine tooth on each side. Color above brown, sides and belly silvery; dorsal fin with four oblique dark bands; posterior half of the caudal blackish, or with blackish spots; anal with two blackish spots posteriorly. Head $4\frac{2}{3}$ in total length. D. II-34; A. 33.

Porosus. 6.

aa. Abdomen with four longitudinal series of pores; each of which is accompanied by a shining silvery body; four rows of pores on sides of body. Color dark brownish above, below with brassy reflections; dorsal and anal with dark margins, a dark blotch below eye. Head $3\frac{3}{4}$ in length. D. II-37; A. 33.

b. Teeth on palatines numerous, subequal, none of them much enlarged; two canine teeth on each side on vomer, the inner ones usually about $\frac{1}{2}$ length of outer ones.

Margaritatus. 7.

bb. Teeth on palatines unequal, few; one to three on each side enlarged and canine-like; one canine tooth on each side on vomer.

Porosissimus. 8.

6. *Porichthys porosus*.

Batrachus porosus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 506 (Valparaiso); Gay, "Hist. Chili Zool., ii, 1844-54, 296 (Chili)."

Porichthys porosus Günther, Cat. Fish. Brit. Mus., iii, 1861, 177 (Chili); Jordan, Proc. U. S. Nat. Mus., 1884, 41.

Habitat.—Western Coast of South America, Chili.

We have not seen this species; we only know it from the accounts above cited.

7. *Porichthys margaritatus*. Midshipman; Singing-fish; Cabezon; Sapo.

Batrachus margaritatus Richardson, "Voyage Sulphur, Fishes, 1844-45, 67 (Pacific Coast of Central America)."

Porichthys margaritatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 368 (Cape San Lucas; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626 (Central America; no description); Jordan & Gilbert, Syn. Fish. N. A., 1883, 958; Jordan, Proc. Acad. Nat. Sci., 1883, 291 (Panama; Vancouver's Island); Jordan, Proc. U. S. Nat. Mus., 1884, 41.

Porichthys notatus Girard, Proc. Acad. Nat. Sci., 1854, 141; Girard, U. S. Pacific R. R. Survey, 1859, 134 (San Francisco); Goode, Bull. U. S. Nat. Mus., 1879, 32 (Pacific Coast).

Porichthys porosissimus Günther, Cat. Fish. Brit. Mus., iii, 1861, 176 (in part; Vancouver Island); Gill, Proc. Acad. Nat. Sci. Phil., 1862, 280 (California); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 25 (San Diego; no description); Bean, Proc. U. S. Nat. Mus., 1880, 83 (West Coast; San Diego; Santa Barbara; Monterey; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 454 (Puget Sound; San Francisco; Monterey Bay; San Luis Obispo; Santa Barbara; San Pedro; San Diego; no description); Rosa Smith, Ichth. San Diego, 1880 (San Diego); Jordan & Jouy, Proc. U. S. Nat. Mus., 1881, 5 (Santa Barbara; Monterey; San Francisco; Puget Sound; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 65 (West Coast U. S.; no description); Bean, Proc. U. S. Nat. Mus., 1881, 263 (Puget Sound); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 274 (Gulf of California; no description); Jordan & Gilbert, Syn. Fish. N. A., 1883, 751; (not *Batrachus porosissimus* Cuvier & Valenciennes).

Habitat.—Western Coast of North America, from British Columbia to Panama.

This species has been confounded with *porosissimus*, but the absence of canine teeth on palatines (a constant character in all known specimens), warrants its separation. Professor Jordan has also examined the specimens in the British Museum. Those in that collection from the Atlantic have canine teeth on the palatines, the character assigned to *P. plectrodon*, while these are wanting in the examples from the Pacific.

A letter from Dr. H. E. Sauvage to Professor Jordan, states that the type of *Batrachus porosissimus* Cuv. and Val. "has a strong canine tooth on each side of the vomer; on the palatines are seen at first a strong, then some small teeth, and finally a strong curved tooth."

The application of the name *porosissimus* to the present form is thus shown to be improper.

8. *Porichthys porosissimus*.

Batrachus porosissimus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 501 (Surinam; Cayenne; Rio Janeiro; St. Catherine); Jenyns, "Zool. Beagle, 1842, 99."

Porichthys porosissimus Günther, Cat. Fish. Brit. Mus., iii, 1861, 176 (Brazil); Jordan, Proc. U. S. Nat. Mus., 1881, 41; Jordan & Gilbert, Syn. Fish. N. A., 1882, 751; Jordan, Proc. Acad. Nat. Sci. Phil., 1883 (South America).

Porichthys plectrodon Jordan, Proc. U. S. Nat. Mus., 1882, 291 (Galveston); Goode & Bean, Proc. U. S. Nat. Mus., 1882, 236 (Gulf of Mexico; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 307 (Gulf of Mexico; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 616 (Charleston; no description); Jordan & Gilbert, Syn. Fish. N. A., 1883, 958; Bean, Cat. Fish. Exhibited, London Exhibit, 1883, 47.

Habitat.—Atlantic Coast of North and South America, from Charleston to Rio Janeiro.

We have nothing to add to the very detailed description of this species, given by Jordan and Gilbert under the name of *Porichthys plectrodon*. The single specimen examined by us is from Pensacola.

3. **BATRACHUS.**

Batrachus Bloch & Schneider, Systema Ichthyol., 1801, 42 (*didactylus*, *tau*, etc.).

In this genus we recognize one American species, with two varieties; all found in the Atlantic.

Analysis of Species of Batrachus.

Common Characters.—Dorsal spines three; opercle developed as two strong, diverging, subequal spines; subopercle rather well developed; branches of subopercular spine parallel, the lower branch much the shorter. No scales on body. Vertebra 10 + 22; frontal region not depressed, its median ridge prominent. Interorbital long and narrow with a deep groove. Branchiostegals 6. Teeth conical and blunt; lateral teeth on jaws and palatines in single rows. A large foramen in axil of pectoral fin (in North American species). Head about $2\frac{2}{3}$ in length of body; width of head from 3 to 4 in length of body. D. III-24 to 28; A. 19 to 22.

a. Two indistinct rows of pores on sides of body.

b. A fleshy tentacle between nostrils; color brownish or dusky greenish, mottled with darker and lighter, the dark on sides of body in large irregular blotches extending from base of dorsal to about $\frac{2}{3}$ distance to base of anal, and more or less covered with small pale spots; belly and chin plain white or yellowish. In specimens from shallow water or algæ, the brown becomes nearly black and more extended, the belly and chin spotted with darker, and top of the head has no distinct markings; in specimens from deeper water or from coral sand, the coloration is more brownish or yellowish. Soft dorsal with six to nine oblique light bands; anal with five to nine. Caudal and pectoral fins with five to seven light cross-bands, these formed chiefly from light spots; ventrals with some dark markings.

Tau. 9.

bb. No fleshy tentacle between nostrils; color whitish or gray, everywhere blotched or spotted with brownish yellow and black, the black spots on top of head smaller and more numerous than on rest of body; a large black blotch at base of spinous dorsal, running up on fin; three black blotches along base of soft dorsal, which do not extend half the distance to base of anal. Pectoral with black spots which do not form cross-bands. Ventrals with more dark markings than in *tau*. Dorsal, anal and caudal marked nearly as in *tau*.

Tau pardus. 9 b.

aa. Two very prominent rows of pores on sides of body; teeth more numerous than in *Batrachus tau*. Cirri above eyes very large (Cuv. and Val.). *Tau cryptocentrus.* 9 c.

9 a. *Batrachus tau*. Toad-fish; Sapo.

Gadus tau Linnæus, Systema Naturæ, ed. xii, 1766, 439 (Carolina); Schoepf, Beobacht. viii, 1788, 141 (New York); Walbaum, Genera Pisc., 1792, 135 (Eastern America).

Batrachus tau Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 478 (New York); De Kay, New York Fauna, Fish, 1842, 168, pl. 28, f. 26 (New York); Storer, Syn. Fish. N. A., 1846, 132; Günther, Cat. Fish. Brit. Mus., iii, 1861, 167 (New York; New Orleans); Gill, Cat. Fish. East Coast N. A., 1861 (name only); Poey, Syn. Pisc. Cuba, 1868, 390 (Cuba); Gill, Report U. S. Fish Comm., 1871-72, 798 (New Jersey; Florida; Cuba; no description); Baird, Report U. S. Fish Comm., 1871-72, 824 (Wood's Holl); Poey, Enumeratio Pisc. Cubensium, 1875, 136 (Cuba); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 372 (Beaufort, N. C.; no description); Goode, Proc. U. S. Nat. Mus., 1879, 110 (Mouth of the St. John's River, Fla.; no description); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 127 (Pensacola); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 334 (Pensacola; Beasley's Point, N. J.; Norfolk, Va.; Punta Russa, Fla.; Wood's Holl, Mass.; Indianola, Tex.); Goode, Bull. U. S. Nat. Mus., xiv, 1879, 32 (Wood's Holl; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 83 (Wood's Holl, Mass.; Noank, Conn.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 291 (Pensacola, Fla.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 616 (South Carolina; no description); Jordan & Gilbert, Syn. Fish. N. A., 1882, 750; Bean, Cat. Fish. Ex. U. S. Nat. Mus., 1883, 47; Jordan, Proc. U. S. Nat. Mus., 1884, 143 (Key West; no description).

Lophius bufo Mitchill, Trans. Lit. and Phil. Soc., New York, 1815, 463 (New York).

Batrachoides vernullas Le Sueur, "Mem. Mus., v, 1819, 157, pl. 17."

Batrachoides variegatus Le Sueur, Jour. Acad. Nat. Sci. Phila., iii, 1823, 399 and 401 (Egg Harbor, New Jersey).

Batrachus variegatus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 484 (copied); Storer, Fish. Mass., 1839, 74 (Holmes' Hole); Storer, Syn. Fish. N. A., 1846, 133 (New York); Gill, Cat. Fish. East Coast N. A., 1861, 43 (Name only).

Batrachus celatus De Kay, New York Fauna, Fish, 1842, 170, pl. 50, f. 161 (New York); Storer, Syn. Fish. N. A., 1846, 133; Gill, Cat. Fish. East Coast N. A., 1861, 43 (Name only).

Habitat.—Atlantic Coast of North America, from Cape Cod to Cuba.

We have examined numerous specimens (from 3 to 9 $\frac{3}{4}$ inches in length) of this species from Key West, Florida. We find among these apparently the varieties *A* and *B* of Dr. Günther, and also intermediate grades.

In the young specimens the head is more narrow and rounded, and the lower branch of the subopercular spine proportionally larger than in the adult.

The deeper-water specimens are lighter in coloration than those from near the surface, and those from the coral reefs are paler than those from the green algæ and sea-wrack, otherwise no differences seem to exist.

9 b. *Batrachus tau pardus*.

Batrachus tau var. *pardus* Goode & Bean, Proc. U. S. Nat. Mus., 1879, 336 (Pensacola, Fla.); Jordan & Gilbert, Syn. Fish. N. A., 1883, 751.

Batrachus pardus Goode & Bean, Proc. U. S. Nat. Mus., 1882, 336 (Gulf of Mexico); Bean, Cat. Fish. London Exhibit., 1883, 47 (Pensacola, Fla.); Jordan, Proc. Acad. Nat. Sci. Phila., 1884, 45 (Egmont Key).

Habitat.—Gulf of Mexico; Egmont Key; Pensacola.

The coloration of *pardus* is very different from that of *tau*. In the specimen (13 $\frac{3}{8}$ inches in length, from Pensacola) which we have examined, the fleshy tentacle between nostrils is wanting, while in all the specimens of *B. tau* this is present.

The former seems to be a deep-water variety or subspecies of the latter. The few specimens of *pardus* known are from considerable depths. The texture of the flesh and the skin is less firm than in *tau*.

9 c. *Batrachus tau cryptocentrus*.

Batrachus cryptocentrus Cuvier & Valenciennes, Hist. Nat. Poiss., 1837, 485 (Bahia).

Habitat.—Eastern Coast of South America (Bahia).

This form is known only from the meagre description of Cuvier and Valenciennes. We venture to place it among the varieties of *tau*, as no diagnostic character of importance appears in the description.

4. BATRACHOIDES.

Batrachoides Lacépède, Hist. Nat. Poiss., iii, 1798, 306 (*Batrachoides tau* Lacépède = *Batrachus surinamensis* Bloch).

This genus is closely allied to *Batrachus*, but it seems to be sufficiently distinguished by the scaly body. Two species are found in American waters.

Analysis of Species of Batrachoides.

Common Characters.—Dorsal spines three; opercle developed as two strong diverging spines; subopercle strongly developed; branches of subopercular spine subequal and diverging; body covered with small ctenoid scales; frontal region broad, flat, and slightly depressed, its median ridge rather prominent.

- a. Teeth small, about 14 on vomer; anterior teeth on lower jaw in a band; lateral teeth on palatines enlarged and canine-like, irregularly arranged; pectoral without pores on its inner surface. Color grayish, darker on sides and head; base of soft dorsal pale, with a dark irregular line above; upper part of fin lighter; caudal nearly black; anal fin light, with some dark markings. Head $3\frac{1}{4}$ in length of body; depth 6. D. III-29; A. 26. *Surinamensis.* 10.
- aa. Teeth larger, about 8 on vomer; anterior teeth on lower jaw in two rows; lateral teeth on lower jaw gradually increasing to middle of jaw, behind which they become abruptly smaller, and then gradually increase to end of jaw; three teeth on middle of palatines enlarged and canine-like, the middle one the smallest; pectoral with a row of pores on inner surface. Color olivaceous brown; some indistinct dark cross-bands on body; dorsal with about seven very irregular oblique dark bars, anal with about five; pectorals and caudal dark, with few light cross-bands. Head 3 in length of body. D. III-26; A. 22. *Pacifici.* 11.

10. *Batrachoides surinamensis.*

Batrachoides tau Lacépède, Hist. Nat. Poiss., iii, 1798, 306, pl. 12, fig. 1 (not *Gadus tau* L.)

Batrachus surinamensis Bloch & Schneider, Systema Ichthyol., 1801, 43, tab. 7 (Surinam); Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 1837, 488 (Surinam); Günther, Cat. Fish. Brit. Mus., iii, 1861, 174 (Demarara; British Guiana; West Coast Central America).

Habitat.—Atlantic Coast of Tropical America; a specimen recorded by Dr. Günther from the Pacific Coast.

The single specimen of this species examined by us is from Curuca. The record given by Dr. Günther of this species from the Pacific Coast needs verification. It was not found at Panama by Professor Gilbert.

11. *Batrachoides pacifici*

Batrachus pacifici Günther, Cat. Fish. Brit. Mus., iii, 1861, 173 (Panama); Günther, Fishes Central Amer., 1869, 435 (Panama).

Batrachoides pacifici Gill, Proc. Acad. Nat. Sci. Phila., 1863, 170 (West Coast of Central America); Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 3 (Panama; no description); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626 (Panama; no description).

Habitat.—West Coast of Tropical America; Panama.

The single specimen of this species examined by us is from Panama, at which place the species was found to be abundant by Professor Gilbert.